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PUBLICATION

FISHERY FACTS-3

U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

A large, sepia-toned photograph of Dungeness crab pots on a sandy beach. The pots are made of woven twigs and netting, and are scattered across the sand. The text "dungeness crab pots" is overlaid in the center of the image.

dungeness crab pots

FRED W. HIPKINS

SEATTLE, WA
June 1972

NMFS Extension Publication

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The series Fishery Facts documents developments in research in the fishery sciences, including biology, technology, and engineering. The publications are written by scientists and other staff members of the National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

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DUNGENESS CRAB POTS

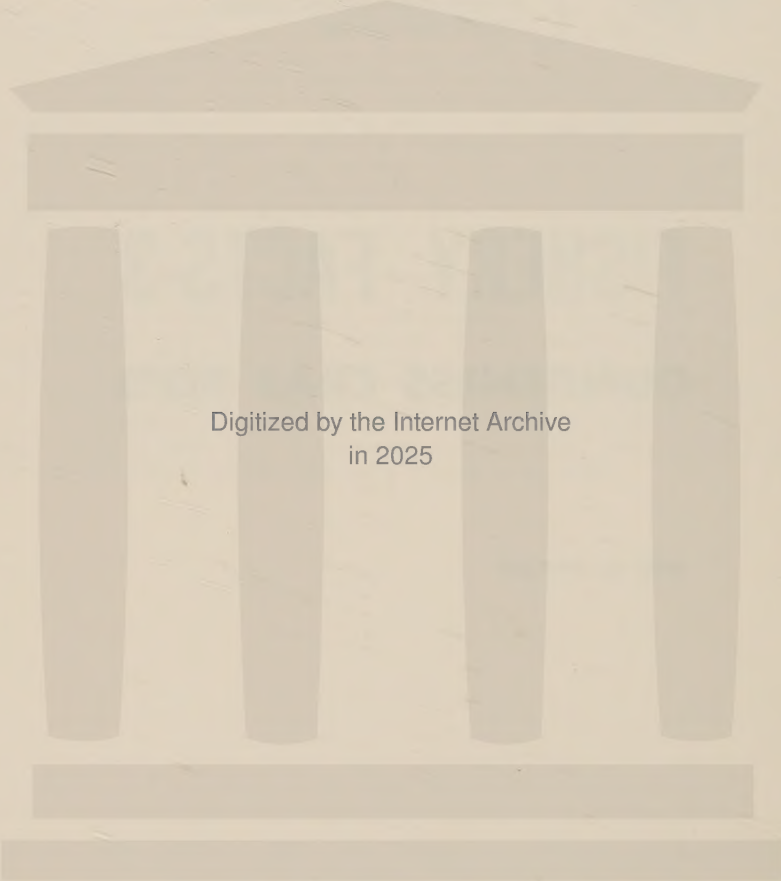
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DUNGENESS CRAB POTS

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INTRODUCTION

Pots or traps were among the earliest types of fishing gear used by man. They are still used in many parts of the world to harvest fishes, but in the Pacific Northwest and Alaskan waters their use is almost entirely for harvesting crabs and shrimp.

The pots described in this report are devices for harvesting Dungeness crab, *Cancer magister*. Dungeness crab is harvested in estuaries, bays, and along coastal shorelines, where sandy and relatively smooth bottoms are found, from California's Channel Islands (Santa Barbara) to Adak, Alaska and in the Bering Sea along the Alaska Peninsula. The number of pots used for harvesting was determined by the number of licenses issued by the States. Several States no longer issue separate licenses for Dungeness crab pots. In place of separate licenses, they now issue licenses for pot fishing which includes pots for King and Tanner crab, shrimp and crayfish, and sablefish. In 1968, however, a reported 78,000 pots were fished in Washington, Oregon and California (Fisheries of the United States, C.F.S. 5000, 1968).

BRIEF HISTORY OF THE DUNGENESS CRAB POT

Beginning around 1855 and up to the early 1930's crab fishing was conducted only in estuaries and bays where a variety of types of homemade pots were fished. Pots were lightweight and lifted by hand as fishermen used Indian dug-out canoes, rowboats and outboard motorboats.

¹ National Marine Fisheries Service Northwest Fisheries Center, Seattle, WA 98102.

The name Dungeness crab pot was adopted in the mid-1930's after the fishery extended to coastal waters and semi-standardization of design occurred. Heavier and shallower pots were required to withstand wave action and tidal currents encountered offshore. A new steel-framed, shallow circular pot was designed, developed, adopted and up to the present time, the basic design has not changed. Improvements in construction materials have been noted and pots are constructed in various diameters although the most preferred sizes are 40-inch and 42-inch diameter. In addition to the standard circular-type pot, a small number of steel-framed rectangular pots are sometimes used, by a few crab fishermen, particularly when fishing inside protected waters.

CONSTRUCTION OF A CIRCULAR POT

Some commercial crab fishermen prefer to build their own pots although they are manufactured by several metal fabricating companies located on the Pacific coast. A circular pot, 42-inch diameter, 14-inches deep, weighing about 90 pounds could be purch-

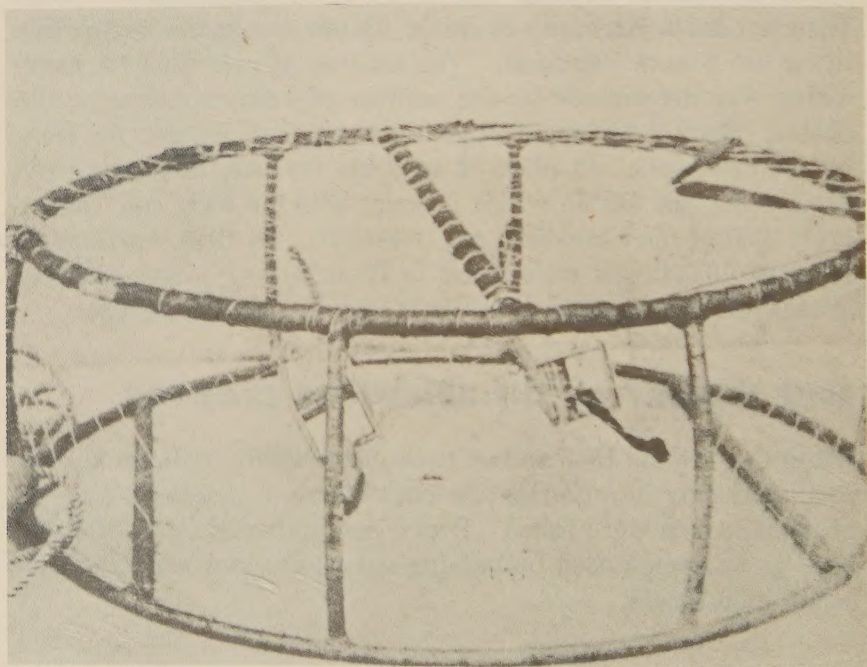


Figure 1.—A standard-type Dungeness crab pot (42-inch diameter).

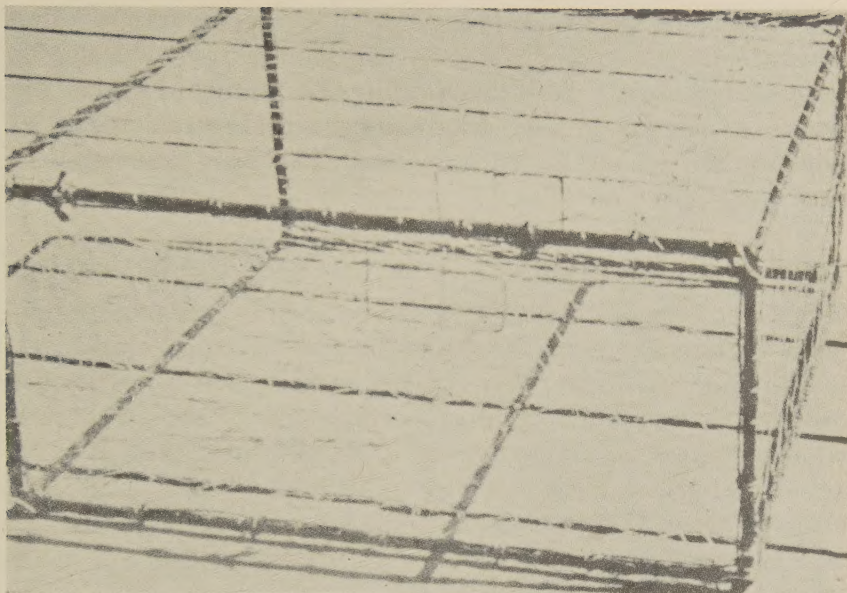


Figure 2.—A rectangular Dungeness crab pot. Its use is confined to inside protected waters.

ased in 1971 for about \$32.00. Completely equipped with line, buoys and bait container, each unit of gear would cost about \$42.00 for each pot.

Frame Construction

The top and bottom circular frames are built with $\frac{3}{4}$ -inch diameter mild structural steel rods. The top frame is 40-inches diameter and the bottom frame is 42-inches diameter. The parts are held in a jig and welded. Two crosspieces of $2\frac{1}{4}$ -inch diameter mild structural steel rods are welded to the bottom frame for additional weight. The top and bottom frames are connected by welding six evenly-spaced support legs of $\frac{3}{4}$ -inch diameter rod that are convexly curved to cause the pot to fall and land right side up on the ocean floor. The curved legs, it is claimed also, prevent the pot from rolling or tumbling on the bottom.

Insulating the Frames

Due to nonsimilarity of metals in pot construction (stainless steel wire webbing) a galvanic action develops when contact is made.

It is important, therefore, to insulate the frames before webbing is attached. Insulation has extended pot life from six months to about six years. To insulate the frames, strips of rubber cut from used automobile and truck tire inner tubes is stretch wrapped and fastened around the entire frame. Following frame insulation, tunnels are installed.

Tunnels and Triggers

Two tunnels opposing each other are installed in each pot. A tunnel is a ramplike approach leading the crab to the opening (eye) into the pot (Figure 3). The tunnel dimension is governed by the distance between the upright supports, generally 20- to 22-inches wide and extending inward from 12 to 15 inches. The opening (eyes) is about 5 inches high and 8 inches in width. It is constructed from 3/16-inch diameter stainless steel rods equipped with either single or double stainless spring wire triggers. Double trigger wires can be seen in Figure 4.

Triggers are free swinging gatelike devices made from heavy gauge (about 1/8-inch) stainless spring wire extending from the top of the opening downward across the bottom. As the crab goes through the opening, the triggers are pushed inward. After the crab enters, the wires fall back into place preventing escape.

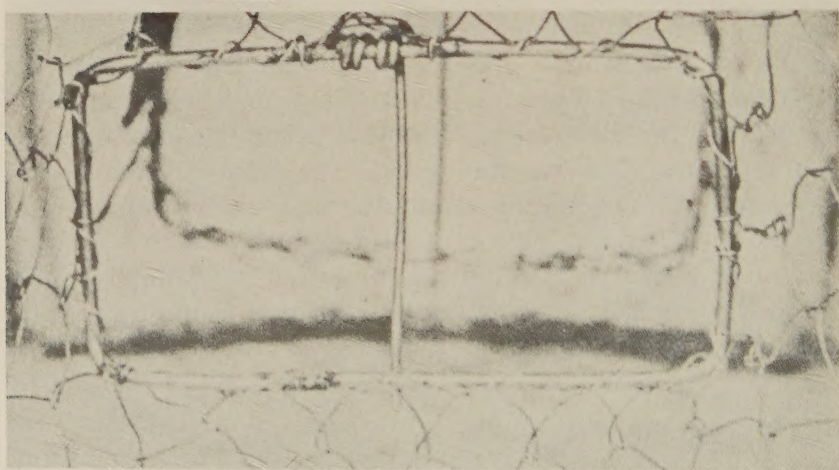


Figure 3.—Tunnel opening (eye) with a single trigger.

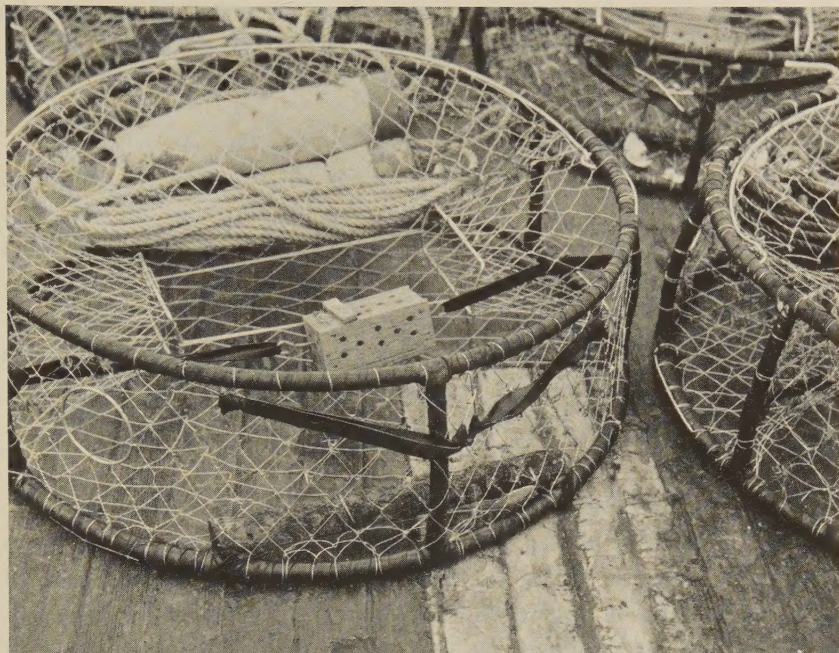


Figure 4.—Looking inside an open pot. Note hinged lid, tunnel arrangement, double wire triggers, line and buoys.

Webbing

Pots are webbed with 19-gauge (about $1/32$ -inch diameter) soft stainless steel wire. The entire pot is webbed with wire of the same gauge. Tunnel approaches are webbed first. The pot is then webbed in sections beginning at a support leg by a tunnel and webbed clockwise from top to bottom to the opposite tunnel. About 2-inch meshes are made in the tunnels and about $4\frac{1}{2}$ -inch mesh covers the remainder of the pot. All the webbing is drawn taut except on bottom. The bottom is loosely webbed intentionally to enable the pot to rest better on the uneven ocean bottom.

Pot Lid

The lid is one-half of the top. A small frame of $1/4$ -inch diameter stainless steel rod is formed to a half round (half circle) matching the top frame. The top with the lid is webbed by attaching the webbing to one-half of the top pot frame and one-half to the lid frame. The lid frame is hinged (see Figure 4) and when closed is held in place with rubber bands stretch lapped over the lid

frame and hooked into the top webbing with stainless steel hooks attached to the ends of the bands.

POT EQUIPMENT

The selection of equipment such as buoy lines, buoys, and bait containers is most important. Buoy lines must be strong and durable as the sudden rise of the vessel in waves puts excessive strain on the line when the pot is being hauled. Buoys establish owners' identification and location of the pot. Bait containers are designed for the type of bait selected to attract and entice the crab to enter the pot.

Buoy Line

Synthetic lines (polypropylene, polyamide, and polyesterlene) offering higher tensile strength and longer life are now used in place of manila lines. Polypropylene is a floating line and polyamide and polyesterlene are sinking lines. Fishermen generally prefer ½-inch diameter with crab lay texture. Sinking line is generally used by itself when fishing shallower than 10 fathoms. At depths from 10 to 40 fathoms, fishermen most often use a floating line attached to the pot and a sinking line just below the surface. From 25 to 30 percent ratio of excess line is used. For example, to fish a depth of 20 fathoms about 25 fathoms of line is used.

Bait Containers

Containers are small, plywood boxes, stainless steel or aluminum-type containers, sausage-shaped plastic containers, or even a small-sized glass jar. Four types can be seen in Figure 5. The plastic type is a recent development and was not available when the photograph was taken. The bait container is always centered in the pot between the tunnel eyes. The type used most often depends on the fishermen's preference, kind of bait, and the fishing area. The glass jar type is often used when sea lice appear in the fishing area.

FISHING METHODS

Methods of fishing are generally the same for either offshore or inside waters. The only exception may be use of different baits, time of seasons, vessel size and number of crew members. Small

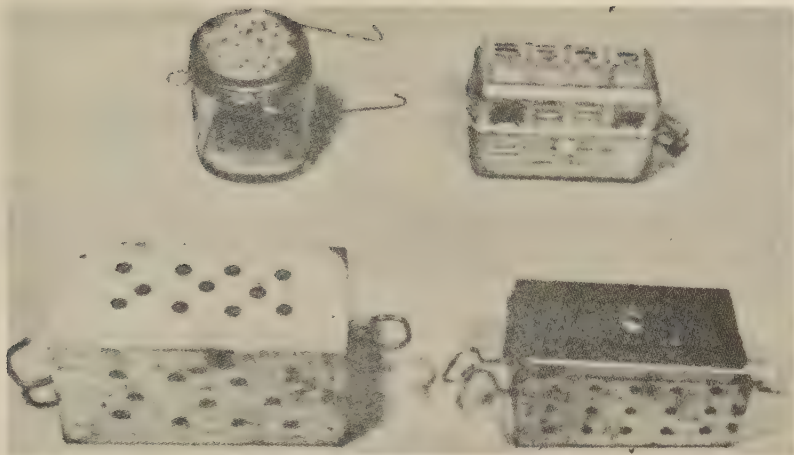


Figure 5.—Bait containers used in the Dungeness crab pot fishery. (Plastic type not available when photo was taken.)

vessels generally operate with two men while larger vessels have a crew of three.

Baits

Most crab fishermen believe that the Dungeness crab is best attracted to fish and clams that are in fresh-like condition. In recent years, herring, squid, and shad have been used extensively in most fishing areas as the cost is considerably less than for clams. Each time pots are lifted, they are re-baited with fresh bait. Attempts have been and are still being made to develop artificial baits although none have been successful.

Setting the Pots

Pots are set in rows, the length depending on the fishing area. The distance between pots is from 200 to 300 feet; fishing depths can range from 12 to 240 feet. Before setting out pots, they are checked to make certain the buoy line is properly attached and coiled, bait containers baited, lid fastened, and buoys properly attached. Range bearings are taken for locating the pots. When all is ready, the vessel runs a straight course as pots are dropped over the side.

Hauling

When hauling, the vessel generally travels against the current. This allows time to gather in the buoys and start hauling the pot by the time the vessel is over it. The pot is taken aboard, emptied, rebaited, and made ready to re-set before the next pot is hauled. One crewman readies the pot for re-setting while the second crewman sorts the catch by returning female or undersize crab to the water and puts the legal crabs in the live-well aboard the vessel.

A crab vessel never stops to haul a pot but keeps traveling at a low speed allowing just enough time for hauling, emptying, rebaiting, and stacking for re-setting before reaching the next pot.

An average boat crew (3 men) can haul and re-set about 300 pots a day.



Figure 6.—A hydraulically driven power block for hauling crab pots.
Note sorting bin.

Sanding Down

Pots often become sanded down (buried in the sand) during foul weather when the vessel is prevented from hauling for long periods (4 or more days). Sanding down occurs more frequently at depths shallower than 8 fathoms. To prevent loss of pots, vessels generally carry aboard handy billies (fire pumps) for blasting sand away from the pots. A fire-type nozzle is attached to a 1½-inch to 2-inch diameter hose, loose ringed to the buoy line and lowered to the buried pot. Water pressure is then applied. From 5 to 30 minutes may be required to free each pot depending on the depth to which it is buried. Pots are often buried in the sand to a depth of 2 fathoms. Vessels can recover up to 50 buried pots in one day. By using this technique of recovering buried pots, pot losses have been greatly reduced.

VESSELS

Vessels in the Dungeness crab fishery range in size from small dories up to about 95 feet in length. Vessels under 30 feet are generally used in inside protected areas, while the large vessels engage in the offshore fishery.



Figure 7.—Dungeness crab vessels at Westport, Washington. These vessels fish offshore (Washington coastal waters).

Holding Tanks

Vessels in offshore crab fishing are equipped with sea water holding tanks. The holding tanks are built into the main hold by constructing water-tight bulkheads fore and aft. Fresh sea water is pumped into the tank by a power driven pump from 3 to 6 inches in size. The water is forced through a series of pipes, 1 to 2 inches in diameter, about 2 feet apart extending the length of the holding tank from the bottom to about one-third the distance up the sides. Small holes are drilled in the pipes about 6 inches apart creating a sprinkling system allowing oxygenated sea water to be distributed evenly to prevent suffocation. From 400 to 1,000 dozen crabs can be kept alive depending on the tank size. Some vessels allow excess water to spill over the hatch combing, while other vessels employ a second pump to remove excess water. At the processing plant the water is pumped out for unloading.

A NEW DEVELOPMENT IN POT FISHING

Mr. R. Barry Fisher, Associate Professor of Fisheries, Oregon State University, Newport, Oregon has been developing a longline crab-pot system. Preliminary testing indicates considerable savings (up to 40-50 percent) may be realized by using smaller, lighter-in-weight pots attached to single groundlines. A publi-



Figure 8.—Mature male Dungeness crab (*Cancer magister*).

cation on his experimental work is now available from the Agriculture Experiment Station, Oregon State University, Corvallis, Oregon. The report is entitled "A Long-line (Set line) Crab Pot System" — Circular of Information No. 630.

THE DUNGENESS CRAB FISHERY

The Dungeness crab fishery, as in other fisheries, has considerable variation in yearly production. Figure 9 shows the number of pounds harvested between 1947 and 1970 exclusive of British Columbia, Canada. Crabs landed from inshore fishing average about 18 pounds per dozen while the offshore crab averages about 24 pounds per dozen. Crabs landed in offshore Alaskan waters have been known to exceed 30 pounds per dozen.

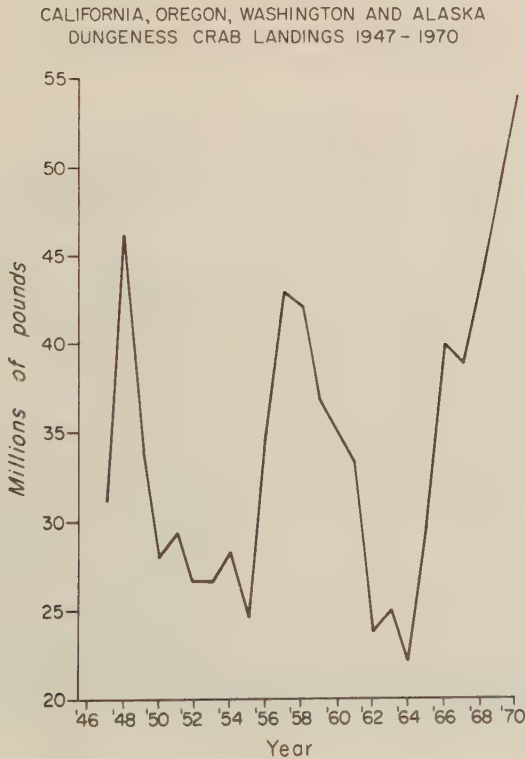


Figure 9.—Graph of Dungeness crab landings (British Columbia excluded), 1947-1970.

Regulations

Commercial fishing regulations may vary from state to state. Variations may be in seasons for both inshore and offshore fishing. Two specific regulations apply to all the states: (1) only male crabs of a specified length may be harvested and (2) pots are the only commercial fishing gear allowed for harvesting Dungeness crab. Each state's regulatory fishing agency should be consulted for the latest information and regulations.

A self-imposed regulation for conservation purposes was adopted by crab fishermen first in California and quickly spread to Oregon, Washington, and Alaska. The regulation requires escape hatches in pots for the smaller females and undersize male crabs. Figure 10 shows a closeup of an escape hatch, built into the side of the pot. Most new pots now have 2 escape hatches; one on each side.

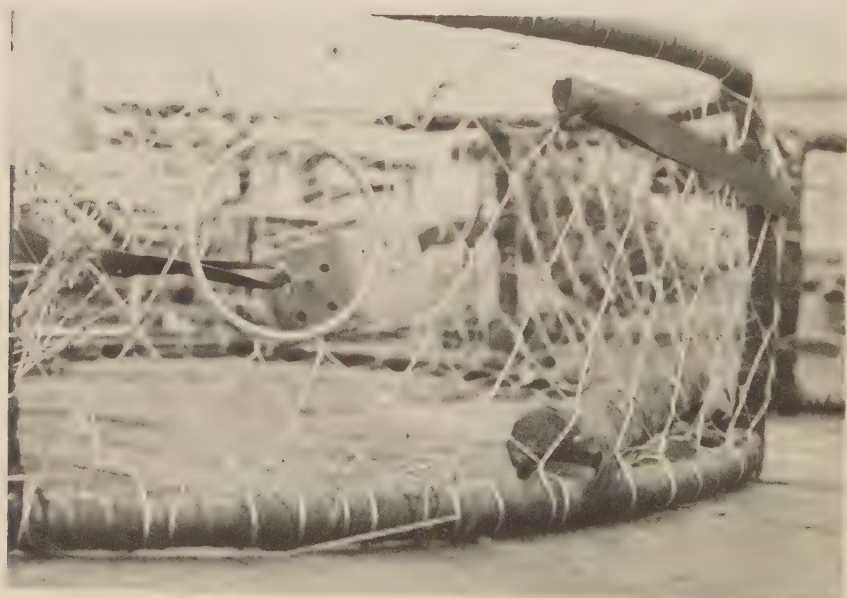


Figure 10.—An escape hatch, one each side allows escapement of female and undersized crabs.

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